

Issue Date: 3 November 2004

NEWS NUMBER:

To : All Komatsu Distributors

SUBJECT: Steering Rod Inspection and Repair Identification

APPLICABLE MACHINES: 930E-2 (all -2 versions)

1. The following instructions provide information for the ultrasonic inspection of steering rods while still installed on the truck.
2. After ultrasonic testing, a “U.T.” stamp is required on the eye if found acceptable. The location of the required stamp is indicated on the photo below:



**Repair Facility  
Code If Repaired**

**Location of UT  
Inspection Stamp**

3. If ultrasonic testing reveals that the weld does not meet Komatsu's U.T. weld requirements, the rod eye is to be painted red and taken OUT OF SERVICE.
4. After the repair of a rejected steering rod, it must be re-tested ultrasonically. If it is found to meet Komatsu's weld criteria, it needs to be stamped as detailed in Step #1. Also, all red paint is to be removed.
5. A three letter stamp will be assigned to every authorized repair facility and the stamp located on the structure rod eye to identify the welding shop that completed the repair.
6. The record keeping will be the responsibility of the Distributor. It will include the following information:



Weld Repair



Field Inspection  
Procedure

7. Each day as the forms are updated they must be sent to your Regional Service Manager.

**ANY QUESTIONS - PLEASE CONTACT KAC ITC SUPPORT TEAM**

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TO: ALL KOMATSU DISTRIBUTORS  
CC: Area Service Managers

2300 Adams Street  
P.O. Box #240  
Peoria, IL 61650-0240

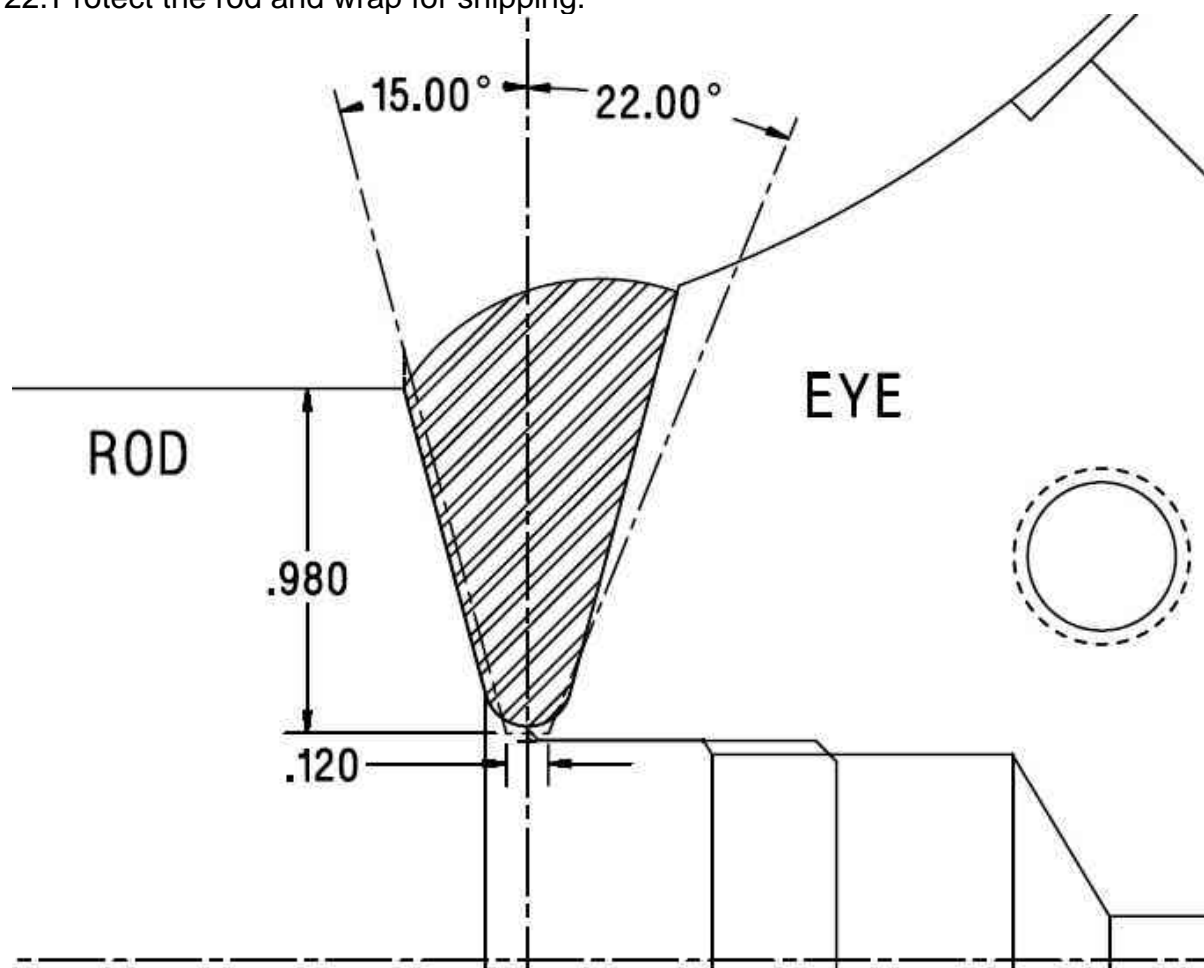
Date: 28 October 2004

Subject: KOMATSU 930E Hydraulic Steering Rod Repairs:

The purpose of this letter is to give detailed instructions and the proper sequence of events for the repair of 930E 3¼" hydraulic steering rods. The repair of each rod eye weld will take 6 1/2 hours of labor. This includes the handling, visual inspection, documentation, weld repair, and the final inspection. If you have any questions regarding these instructions please contact your regional service manager.

1. It is very important that the rod is protected at all times. Do not allow any metal to metal contact. Do not stack the rods without a protective barrier between the rows and layers.
2. On the piston rod eye are several stamps. One will be a date stamp code and the other is the part number. Record all the stamp information.
3. Upon receiving the rod inspect the chrome plating for any damage such as chips, scratches, or flaking. If a rod is found with questionable plating do not repair it at this time. Only repair rods that have good chrome quality. All rods that require replating will be repaired last. Pictures are required as part of the documentation.
4. Check the piston rod straightness. The specification requirement is to be within .006" max per 12" of rod length. Komatsu does not allow the restraightening of any hydraulic piston rods. If any are found bent the rod eye is to be painted RED and documentation on the straightness is to be attached to the piston rod.
5. Remove the bearing from the rod eye and protect all the threaded bolt holes during the entire repair process.
6. The weld is to be removed only by machining.
7. A diagram of the area to be removed has been attached. Make sure that this is fully understood prior to any machining activity. Do not machine deeper than .980" from the surface of the piston rod. This is a 37 Deg. Vee Groove with a .120" root land.
8. After the removal of the weld, using dye penetrant inspect the joint for any side wall cracks. If cracks are detected continue the machining process. The side wall angle of the VEE Groove cannot change. Additional side wall material can be removed up to .125" If additional material has been removed a second dye penetrant inspection is required.
9. Clean the joint removing all dye penetrant and developer.
10. Position the rod for welding.
11. Cover for protection all the exposed chrome plated areas.
12. Position the rod to the rod eye checking parallelism and the perpendicularity of the rod eye to the piston rod.
13. All welding is to be completed according to Komatsu's "Parts & Service News" letter AA00046C. This is available through any Komatsu distributorship.
14. All welders must be must trained and qualified for welding in all positions and weld in compliance with AWS D1.1 and D14.3.
15. Tack weld (.12") at two locations. The tacks are to be at 180 Deg to each other in the root to hold the alignment of the rod eye to the rod.

16. Rotate the piston rod while preheating the Vee Groove to 250 Deg F. (121 Deg C.). This will apply the heat uniformly. This activity needs to be done carefully so no direct heat is applied to the chrome surface area. This pre-heating is being done to eliminate any coolant that was trapped in the Vee Groove joint during machining.
17. While the joint is hot from pre-heating start the welding process using AWS ER80S-D2 solid wire with .035 or .045 wire. Welding gas is to be a Argon 95/5. Do not allow joint to cool. The welding of the Vee Groove joint is to be completed from start to finish without any stops.
18. The weld is to have a .125" crown with a smooth profile and a good transition to the parent material. NO UNDERCUT is allowed.
19. After the weld area has cooled Ultrasonically test the entire weld joint for 100% penetration. This is to be done using the approved Komatsu inspection process. Using a 45 Deg and 70 Deg testing method carefully inspect weld area and document test results. The entire weld circumference of the weld is to be visually inspected using Dye Penetrant.
20. On the rod eye stamp a repair shop letter (To Be Assigned) date, and serial number.
21. Fill out the required ultrasonic test report form.
22. Protect the rod and wrap for shipping.



# Komatsu America Corp.

2300 N.E. Adams Street  
Peoria, IL 61639

## Field Inspection Procedure

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Subject: Ultrasonic Inspection of Rod Structure Weldment Part No. EH3824

Compiled by: P. Schmidt Date: 10/27/04

Approved by: R. Schleifer Date: 10/28/04

Revised by: \_\_\_\_\_ Date: \_\_\_\_\_ Revision No. \_\_\_\_\_

### 1.0 Scope:

1.1 This procedure shall govern Ultrasonic testing of the weldments of Rod Eye Structures according to KAC Field Campaign instructions. All the guidelines of the AWS D1.1-98 Section 6.3 shall be followed. Should any conflict between specifications and AWS D1.1-98 occur, this procedure shall take precedence.

1.2 Procedure must be performed by a Level 3 NDT Test Engineer.

### Shear Wave Inspection of Rod Structure

### 2.0 Equipment:

- 2.1 Panametrics Epoch III Ultrasonic Machine (or equivalent)
- 2.2 5 MHz 0.375" Diameter Transducer
- 2.3 0.500" 70° Angle Probe and 0.500" 45° Angle Probe
- 2.4 ASTM E-164 IIW Type I Calibration Block<sup>1</sup>
- 2.5 Sonotech Grade 40 Ultrasonic Couplant or equivalent

### 3.0 Settings: (Method I) See Attachment 1.A.

- 3.1 Velocity = 0.1270
- 3.2 Angle = 45° Probe
- 3.3 Thickness = Half Skip/1.00" Depth
- 3.4 Range = Inch/Divisions
- 3.5 Pulsar = Low

### 4.0 Settings: (Method II) See Attachment 1.B.

- 4.1 Velocity = 0.1270
- 4.2 Angle = 70° Probe
- 4.3 Thickness = Half Skip/1.00" Depth
- 4.4 Range = Inch/Divisions
- 4.5 Pulsar = Low

### 5.0 Calibration:

- 5.1 Couple the transducer to the test block at the "0" mark.

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<sup>1</sup> The IIW Block can be purchased from NDTMART.com. (Ref. # CB-02-CS)

# Komatsu America Corp.

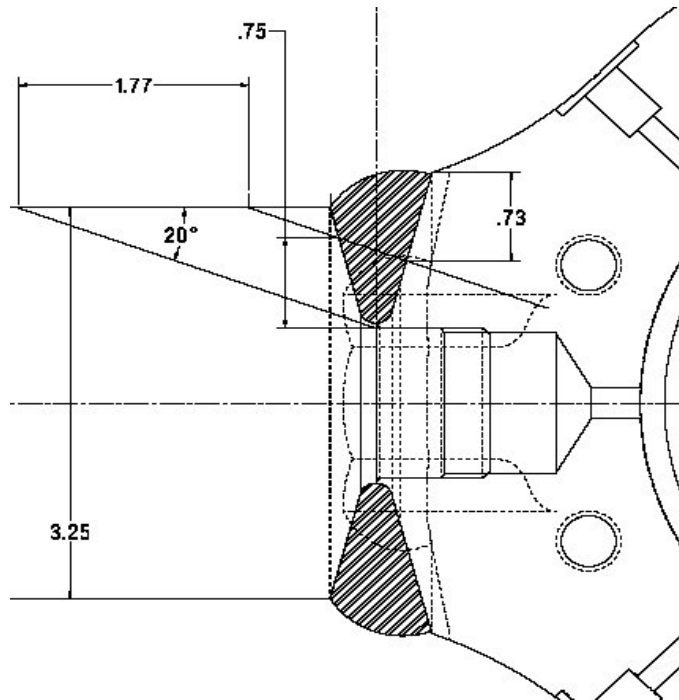
2300 N.E. Adams Street  
Peoria, IL 61639

## Field Inspection Procedure

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- 5.2 Adjust the gain so that the calibration echoes are clearly visible.
- 5.3 Locate the BIP (Beam Index Point) by peaking up on your first echo. Hold the transducer/wedge stationary and mark the side of the wedge directly over the "0" point on the block.
- 5.4 If the refracted angle is not as marked, position the probe over the 70° and 45° mark on the block. Move the probe back and forth to peak up on the echo coming from the large circular hole in the side of the block. After peaking up, hold the probe stationary and note the degree mark on the block that lines up with the BIP. Enter this degree into the UT machine (Item 2.1).
- 5.5 Calibrate for distance by coupling the probe over the "0" mark on the test block.
- 5.6 Adjust the zero offset until the first echo lines up with 4" (100mm) division and the second lines up with 9" (225mm) division.
- 5.7 Calibrate for sensitivity by coupling the transducer pointing toward the 0.03 (1/32") side-drilled hole.
- 5.8 Move the transducer back and forth until you peak up on the hole.
- 5.9 Adjust the gain to bring the reference reflector signal to 60% screen height.
- 6.0 Scanning the Weld:
  - 6.1 Increase the gain 20 dB.
  - 6.2 Couple the transducer perpendicular to the weld.
  - 6.3 Move the transducer back and forth.
  - 6.4 Investigate all indications in the entire weld area as detailed on Attachments 1.A and 1.B.
- 7.0 Acceptance/Rejection Criteria:
  - 7.1 After performing all testing, the AWS D1.1 Report of Ultrasonic Testing of Welds form (Attachment 3) shall be properly completed.
  - 7.2 Acceptance/Rejection Criteria shall be AWS D1.1-98 Table 6.3 and its notes (Attachment 2).
  - 7.3 In addition to 7.1, complete a Flaw Location Report and attach to the AWS D1.1 report.

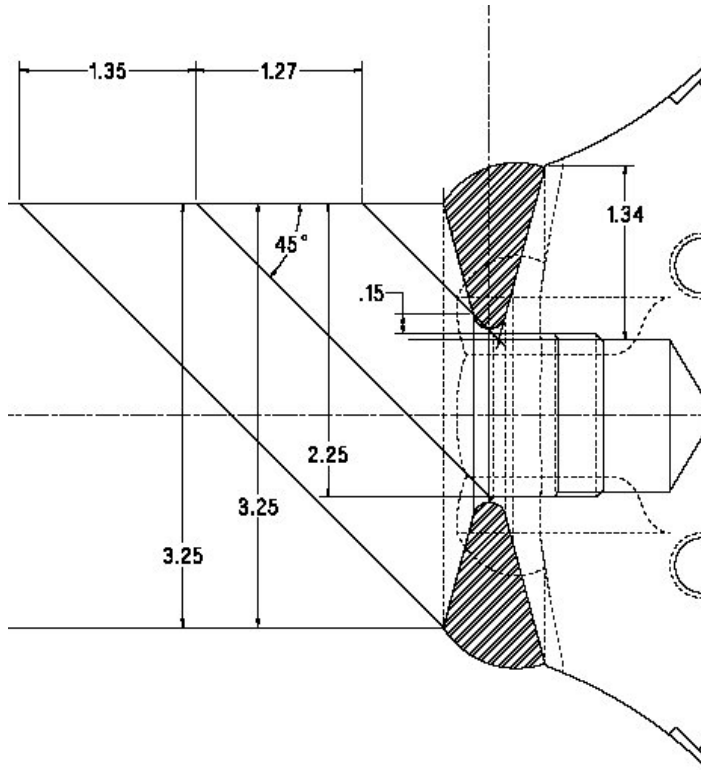
## STEERING CYLINDER ULTRASONIC TESTING



**70 Degree  
Angle Probe**

\* Attachment – 1.A

## STEERING CYLINDER ULTRASONIC TESTING



**45 Degree  
Angle Probe**

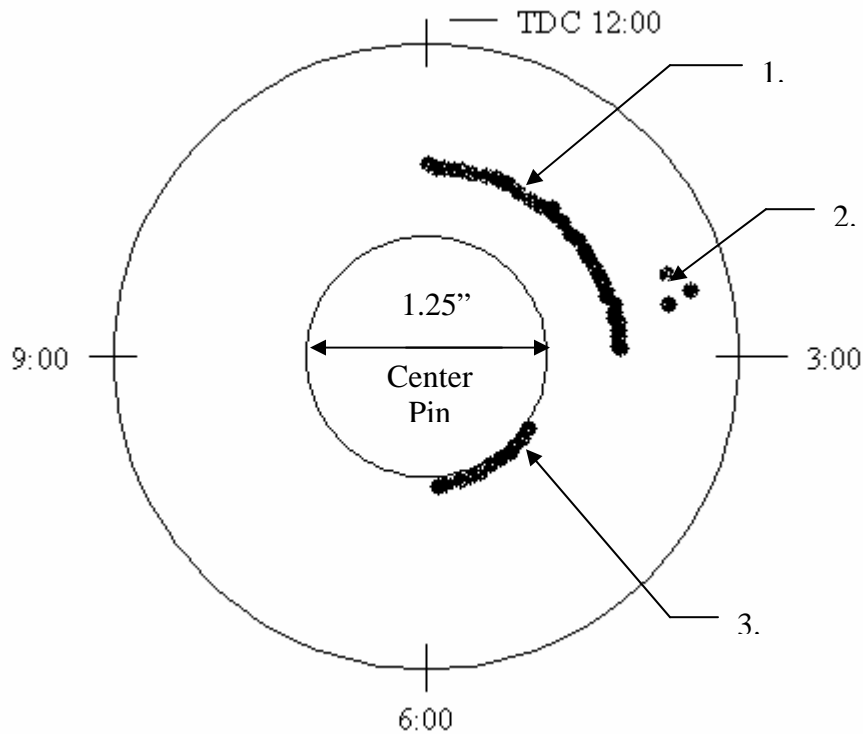
\* Attachment – 1.B



P/N EH3824  
3.25" Dia. Cyl. Rod  
**(SAMPLE)**

Ultrasonic 70° & 45°

# Flaw Location Report



## **Description of Test:**

Explain location of failure, type, depth, and draw on sketch

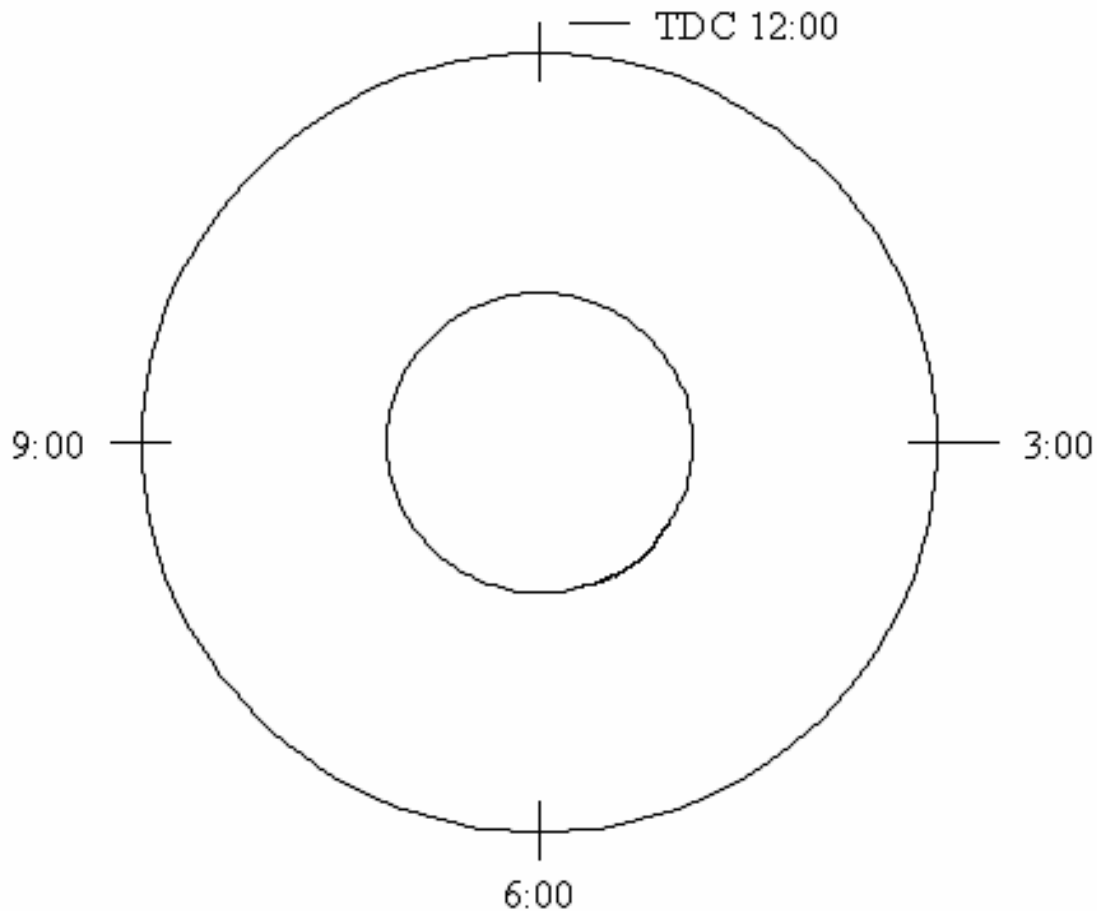
1. 70° Lack of fusion (12:00-3:00)
2. Porosity Cluster 45° (2:30)
3. Lack of Fusion / Crack 45° (4:00-6:00)

**P/N EH3824**  
**3.25" Dia. Cyl. Rod**

**Ultrasonic 70° & 45°**

# **Flaw Location Report**

\*TDC = Top Dead Center needs to be stamped with an "X"



1.

2.

3.

4.

**Table 6.3**  
**Ultrasonic Acceptance-Rejection Criteria (Cyclically Loaded Nontubular Connections)**  
 (see 6.13.2)

Discontinuity Severity Class	Weld Thickness* in in. (mm) and Search Unit Angle										
	5/16 (8) through 3/4 (19)	> 3/4 through 1-1/2 (38)	> 1-1/2 through 2-1/2 (64)			> 2-1/2 through 4 (100)			> 4 through 8 (200)		
	70°	70°	70°	60°	45°	70°	60°	45°	70°	60°	45°
Class A	+10 & lower	+8 & lower	+4 & lower	+7 & lower	+9 & lower	+1 & lower	+4 & lower	+6 & lower	-2 & lower	+1 & lower	+3 & lower
Class B	+11	+9	+5 +6	+8 +9	+10 +11	+2 +3	+5 +6	+7 +8	-1 0	+2 +3	+4 +5
Class C	+12	+10	+7 +8	+10 +11	+12 +13	+4 +5	+7 +8	+9 +10	+1 +2	+4 +5	+6 +7
Class D	+13 & up	+11 & up	+9 & up	+12 & up	+14 & up	+6 & up	+9 & up	+11 & up	+3 & up	+6 & up	+8 & up

**Notes:**

- Class B and C discontinuities shall be separated by at least 2L, L being the length of the longer discontinuity, except that when two or more such discontinuities are not separated by at least 2L, but the combined length of discontinuities and their separation distance is equal to or less than the maximum allowable length under the provisions of Class B or C, the discontinuity shall be considered a single acceptable discontinuity.
- Class B and C discontinuities shall not begin at a distance less than 2L from weld ends carrying primary tensile stress, L being the discontinuity length.
- Discontinuities detected at "scanning level" in the root face area of complete joint penetration double groove weld joints shall be evaluated using an indicating rating 4 dB more sensitive than described in 6.26.6.5 when such welds are designated as "tension welds" on the drawing (subtract 4 dB from the indication rating "d").
- For indications that remain on the display as the search unit is moved, refer to 6.13.2.1.

\*Weld thickness shall be defined as the nominal thickness of the thinner of the two parts being joined.

**Class A (large discontinuities)**

Any indication in this category shall be rejected (regardless of length).

**Class B (medium discontinuities)**

Any indication in this category having a length greater than 3/4 inch (19 mm) shall be rejected.

**Class C (small discontinuities)**

Any indication in this category having a length greater than 2 in. (51 mm) in the middle half or 3/4 inch (19 mm) length in the top or bottom quarter of weld thickness shall be rejected.

**Class D (minor discontinuities)**

Any indication in this category shall be accepted regardless of length or location in the weld.

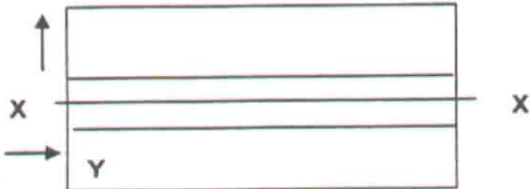
**Scanning Levels**

Sound path** in in. (mm)	Above Zero Reference, dB
through 2-1/2 (64 mm)	20
> 2-1/2 through 5 (64-127 mm)	25
> 5 through 10 (127-254 mm)	35
> 10 through 15 (254-381 mm)	45

\*\*This column refers to sound path distance; NOT material thickness.

## REPORT OF ULTRASONIC TESTING OF WELDS

Remarks \_\_\_\_\_



We, the undersigned, certify that the statements in this record are correct and that the welds were prepared and tested in accordance with the requirements of C of AWS D1.1, (2000) Structural Welding Codes

Attachment 3

